What is Claimed is:

1. A catalytic system for enhancing perchlorate ion reduction; wherein the system comprises one or more titanium assemblies, each titanium assembly comprising two or more titanium cations, wherein the cations in the assembly are capable of transferring electrical charge to the perchlorate ion, thereby reducing the oxidation state of the chlorine center of the perchlorate ion, and wherein said titanium cations are in a moderately polar environment.

2. The catalytic system of Claim 1, wherein the titanium assembly is a dimer of titanium cations.

3. The catalytic system of Claim 1, wherein the moderately polar environment comprises ethyl alcohol.

4. The catalytic system of Claim 1, wherein the moderately polar environment comprises a non liquid phase comprising a core and a surface, wherein the surface comprises a functional group having an effect on the interaction between the titanium cations and the perchlorate ion approximately the same as the effect of ethyl alcohol.

5. The catalytic system of Claim 4, wherein the core is hydrophobic.

6. The catalytic system of Claim 4, wherein the core comprises polyvinyl.

7. The catalytic system of Claim 4, wherein the core comprises silica gel.

8. The catalytic system of Claim 4, wherein the functional group is a hydroxyl group.

9. The catalytic system of Claim 1, further comprising a ligand in interaction with the titanium assembly.

10. The catalytic system of Claim 9, wherein the ligand comprises a molecule selected from the group consisting of TADP3(COOH)$_2$; TADP3; 6-amino-6-(4-aminobenzyl)-1,4,8,11 tetraazacyclotetradecane; 1,4,7-triazacyclononane-N,N',N"-triacetic acid; N,N',N'-tris(2-pyridylmethyl)-cic,cis-1,3,5-triaminocyclohexane; α-cyclodextrin; saphyrins and porpherin analogues thereof; HEDTA; DADP3; CYCAPAB.

11. The catalytic system of Claim 4, further comprising a ligand in interaction with the titanium assembly.

12. The catalytic system of Claim 11, wherein the ligand comprises a molecule selected from the group consisting of TADP3(COOH)$_2$; TADP3; 6-amino-6-(4-aminobenzyl)-1,4,8,11 tetraazacyclotetradecane; 1,4,7-triazacyclononane-N,N',N"-triacetic acid; N,N',N'-tris(2-pyridylmethyl)-cic,cis-1,3,5-triaminocyclohexane; α-cyclodextrin; saphyrins and porpherin analogues thereof; HEDTA; DADP3; and CYCAPAB.

13. The catalytic system of Claim 11, wherein the ligand is immobilized on the surface of the non-liquid phase.

14. A method of reducing perchlorate ions, wherein the method comprises contacting the perchlorate ions with a catalytic system comprising one or more titanium assemblies, each titanium assembly comprising two or more titanium cations, wherein the cations in the assembly are capable of transferring electrical charge to the perchlorate ion, thereby reducing the oxidation state of the chlorine center of the perchlorate ion, and wherein the titanium cations are in a moderately polar environment.

15. The method of Claim 14, wherein the titanium assembly is a dimer of titanium cations.

16. The method of Claim 14, wherein the moderately polar environment comprises ethyl alcohol.

17. The method of Claim 14, wherein the moderately polar environment comprises a non liquid phase comprising a core and a surface, wherein the surface comprises a functional group having an effect on the interaction between the titanium cations and the perchlorate ion approximately the same as the effect of ethyl alcohol.

18. The method of Claim 17, wherein the core is hydrophobic.

19. The method of Claim 17, wherein the core comprises polyvinyl.

20. The method of Claim 17, wherein the core comprises silica gel.

21. The method of Claim 17, wherein the functional group is a hydroxyl group.

22. The method of Claim 14, further comprising a ligand in interaction with the titanium assembly.

23. The method of Claim 22, wherein the ligand comprises a molecule selected from the group consisting of TADP3$(COOH)_2$; TADP3; 6-amino-6-(4-aminobenzyl)-1,4,8,11 tetraazacyclotetradecane; 1,4,7-triazacyclononane-N,N',N''-triacetic acid; N,N',N'-tris(2-pyridylmethyl)-cic,cis-1,3,5-triaminocyclohexane; α-cyclodextrin; saphyrins and porpherin analogues thereof; HEDTA; DADP3; and CYCAPAB.

24. The method of Claim 17, further comprising a ligand in interaction with the titanium assembly.

25. The method of Claim 24, wherein the ligand comprises a molecule selected from the group consisting of TADP3(COOH)$_2$; TADP3; 6-amino-6-(4-aminobenzyl)-1,4,8,11 tetraazacyclotetradecane; 1,4,7-triazacyclononane-N,N',N''-triacetic acid; N,N',N'-tris(2-pyridylmethyl)-cic,cis-1,3,5-triaminocyclohexane; α-cyclodextrin; saphyrins and porpherin analogues thereof; HEDTA; DADP3; and CYCAPAB.

26. The method of Claim 14, wherein the ligand is immobilized on the surface of the non-liquid phase.

27. A process of removing perchlorate ions from water, wherein the process comprises reducing perchlorate ions by contacting the perchlorate ions with a catalytic system comprising one or more titanium assemblies, each titanium assembly comprising two or more titanium cations, wherein the cations in the assembly are capable of transferring electrical charge to the perchlorate ion, thereby reducing the oxidation state of the chlorine center of the perchlorate ion, and wherein said titanium cations and perchlorate ion are in a moderately polar environment.

28. A process of removing perchlorate ions from rocket fuel waste, wherein the process comprises reducing perchlorate ions by contacting the perchlorate ions with a catalytic system comprising one or more titanium assemblies, each titanium assembly comprising two or more titanium cations, wherein the cations in the assembly are capable of transferring electrical charge to the perchlorate ion, thereby reducing the oxidation state of the chlorine center of the perchlorate ion, and wherein said titanium cations and perchlorate ions are in a moderately polar environment.

29. The compound 11, 23-dihydroxicarbonyl-25, 26-dihydroxy-3, 7, 15, 19-tetraazatricyclo [19. 3. 1. 19. 13]hexacosa-1(25), 9(26), 10, 12, 21, 23-hexaene or a derivative thereof capable of chelating a titanium assembly having two or more titanium cations.

30. A method of reducing perchlorate ions, wherein the method comprises contacting the perchlorate ions with a catalytic system comprising one or more titanium assemblies, each titanium assembly comprising two or more titanium cations in an oxidation state lower than the oxidation state of Ti^{IV}.